Alternative Development

Source Control Action
Lower Passaic River Restoration Project

Remedial Options Workgroup Meeting
June 30, 2009

207074

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R2-0016504

FFS Alternatives - As of October 2008

#	Alternative	DMM Scenario	Dredged Sediment Volume (MCY)	Cost in Billion $
1	No Action	N/A	0	Minimal
2	Dredging	CDF Disposal	11	1.3
3		Off-site Treatment and Disposal		3.6
4		Decontamination and Beneficial Use		1.7
5	Capping	CDF Disposal	3.2	0.7
6		Off-site Treatment and Disposal		1.8
7		Decontamination and Beneficial Use		0.9
8	Capping with Navigation in Lower 1.9 miles	CDF Disposal	4.2	0.8
9		Off-site Treatment and Disposal		2.2
10		Decontamination and Beneficial Use		1.0

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Revisions to Alternatives for 2009 FFS

- Reorganized remedial options & DMM scenarios:
  - 3 Alternatives, 3 DMM Scenarios
- Revised modeling indicates less dredging required to control flooding impacts. Pre-dredge for cap only. Include 6-in. "smoothing layer" over armor stone.
- Because CAD disposal creates less environmental impact, both CAD and CDF disposal are being analyzed in the FFS.

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Summer 2009 – Current Alternatives

#	Alternative[a]	DMM Scenario	Dredged Sediment Volume (MCY)	Cost in Billion $	Other Considerations
1	No Action	N/A	0	Minimal	Existing level of risk
2	Deep Dredging with Backfill	CAD/CDF Disposal [b]	11	1.3	Habitat impact, construction-phase impacts, long-term maintenance
		Off-site Treatment and Disposal		3.7	Large on-land footprint, construction-phase impacts
		Decontamination and Beneficial Use		1.6	Large on-land footprint, emissions, construction-phase impacts
3	Capping with Dredging for Flooding & Navigation	CAD/CDF Disposal [c]	3.4	0.8	Habitat impact, long-term maintenance
		Off-site Treatment and Disposal		2.0	Large on-land footprint, long-term maintenance
		Decontamination and Beneficial Use		0.9	Large on-land footprint, emissions, long-term maintenance

Notes:

a: All alternatives cause no additional flooding.

b: Alternative 2 - Cost provided for a CDF.

c: Alternative 3 - Cost provided for a CAD/CDF.

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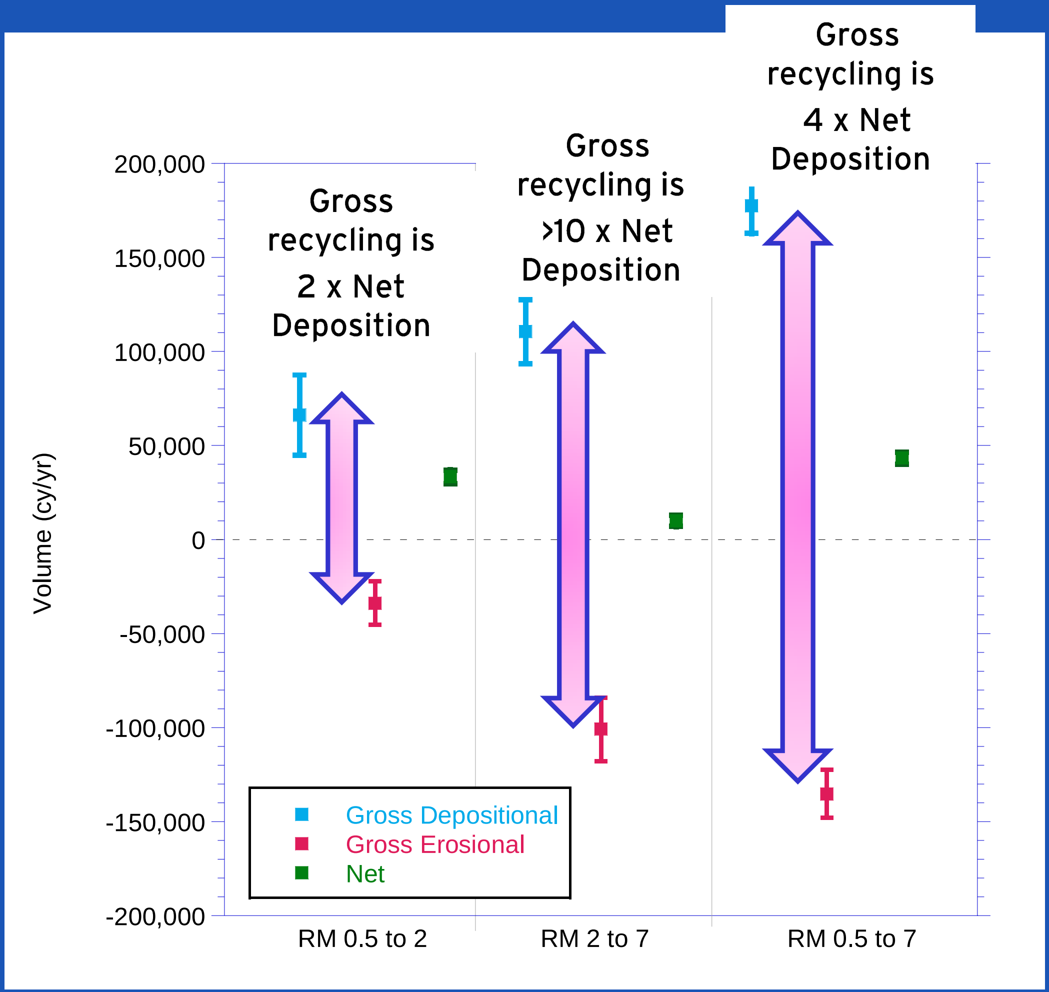
Sediment Transport Modeling Scenarios

- Thin Layer Cap
- Discrete Capping (3 scenarios)
- Construction-Phase Impacts (resuspension)
- Sequencing Runs (RM0-RM8 vs. RM8-RM12)

Gross Cycling Prevents Recovery

Depositional, Erosional and Net Sediment Volumes, 1989 to 2007



Conclusions:

- Gross sediment recycling ~4 X net deposition
- >80% of net deposition occurs below RM2
- Net deposition in RM2 to RM7 is less than 1/3 inch/yr

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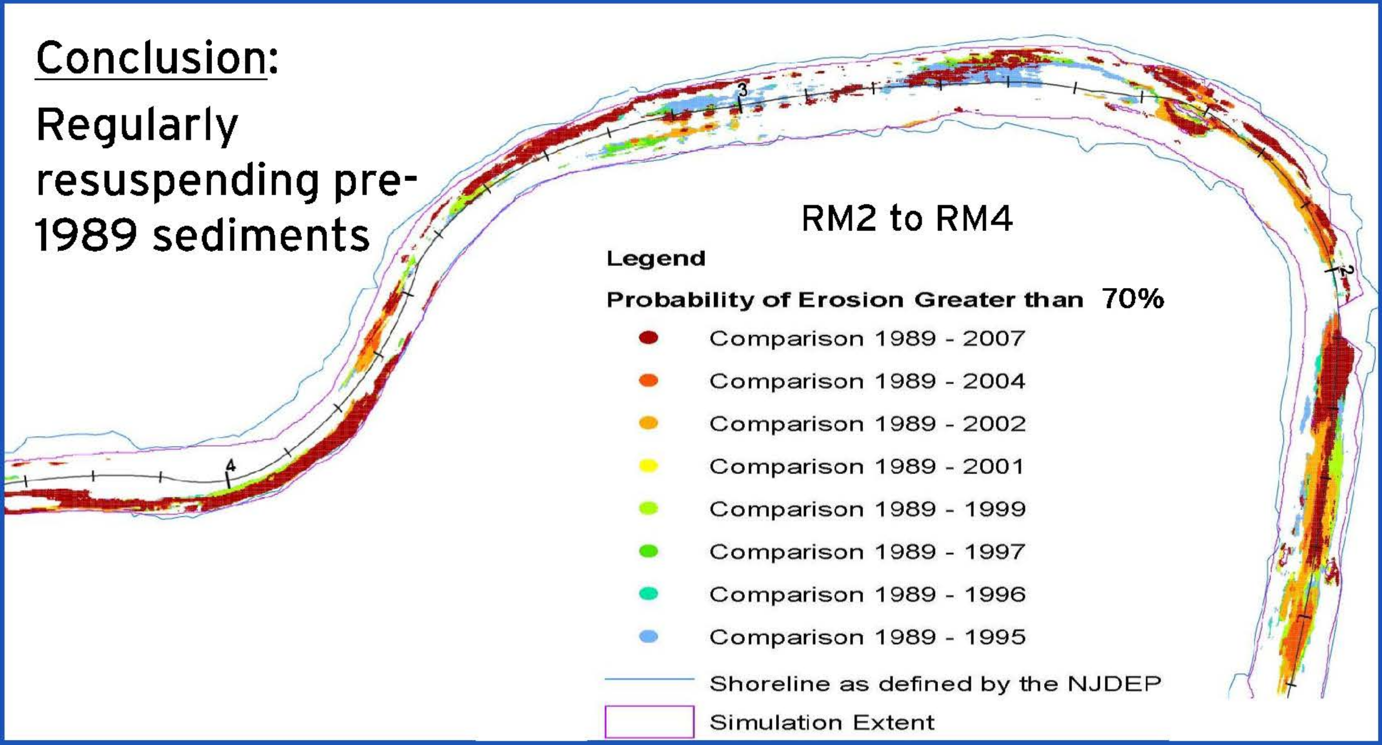
Sediment Stability Evaluation:
Erosion Relative to 1989 Bathymetry

Conclusion:

Regularly resuspending pre-1989 sediments



- Colored areas correspond to >= 70 percent probability of erosion of at least 3 inches relative to the 1989 surface

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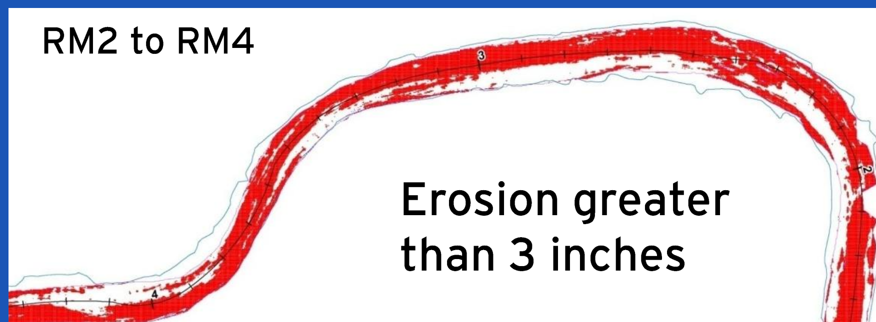
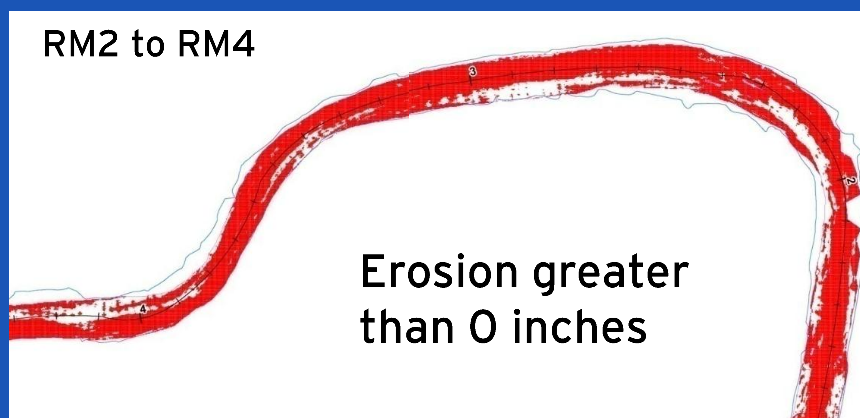
Sediment Stability Evaluation:
Erosion Based on Multiple Bathymetric Comparisons

- Areas in red correspond to ≥ 70 percent probability of erosion for all combinations of bathymetric surveys





Conclusion:

Erosion occurs nearly bank-to-bank throughout the river

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Presentation Outline

- Alternative Development & Conceptual Design Parameters
- Dredged Material Management Scenarios
- Analysis of Construction-Phase Impacts
- Cost Estimates
- Ongoing Activities

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Highly Contaminated Material

- Near 80 Lister Avenue (between RM2.7-RM3.8 and RM4.2-RM4.4)
- Removed within containment
- Estimated volume of 350,000 cubic yards
- 200,000 cubic yards to be removed independently of the Source Control Action
  - 40,000 cubic yards upland
  - 160,000 cubic yards in a CDF

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Conceptual Design: Dredging

- Mechanical dredging used as representative process option
- Conceptual design parameters:
  - Productivity: 2000 cy/day per dredge
  - Accuracy: 1-ft overdredge allowance
  - Residuals: 2-ft backfill
  - Resuspension: Minimize using BMPs
  - Side slopes: 3H:1V

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Conceptual Design: Capping

- Engineered caps used as representative process option

- Conceptual design parameters:
  - Sand thickness: 2 ft.
  - Armor thickness: 18 in. (plus 6-in. filter layer)
  - Armor placement criteria: 3 in. max. erosion under 100-yr flow event
  - "Smoothing layer" in armored areas: 6 in. (plus 6-in. filter layer). Applied to reduce roughness & flooding.

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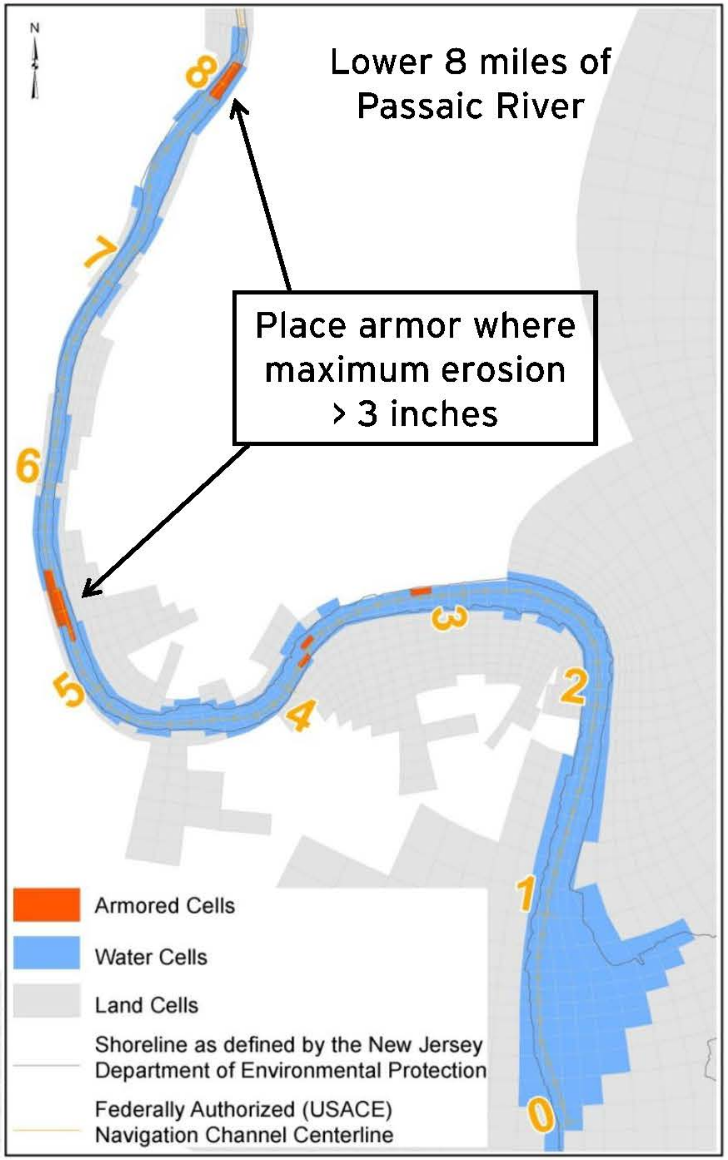
Conceptual Design: Capping

- Armor layout developed using hydrodynamic & sediment transport modeling
- Total of 21 acres armored



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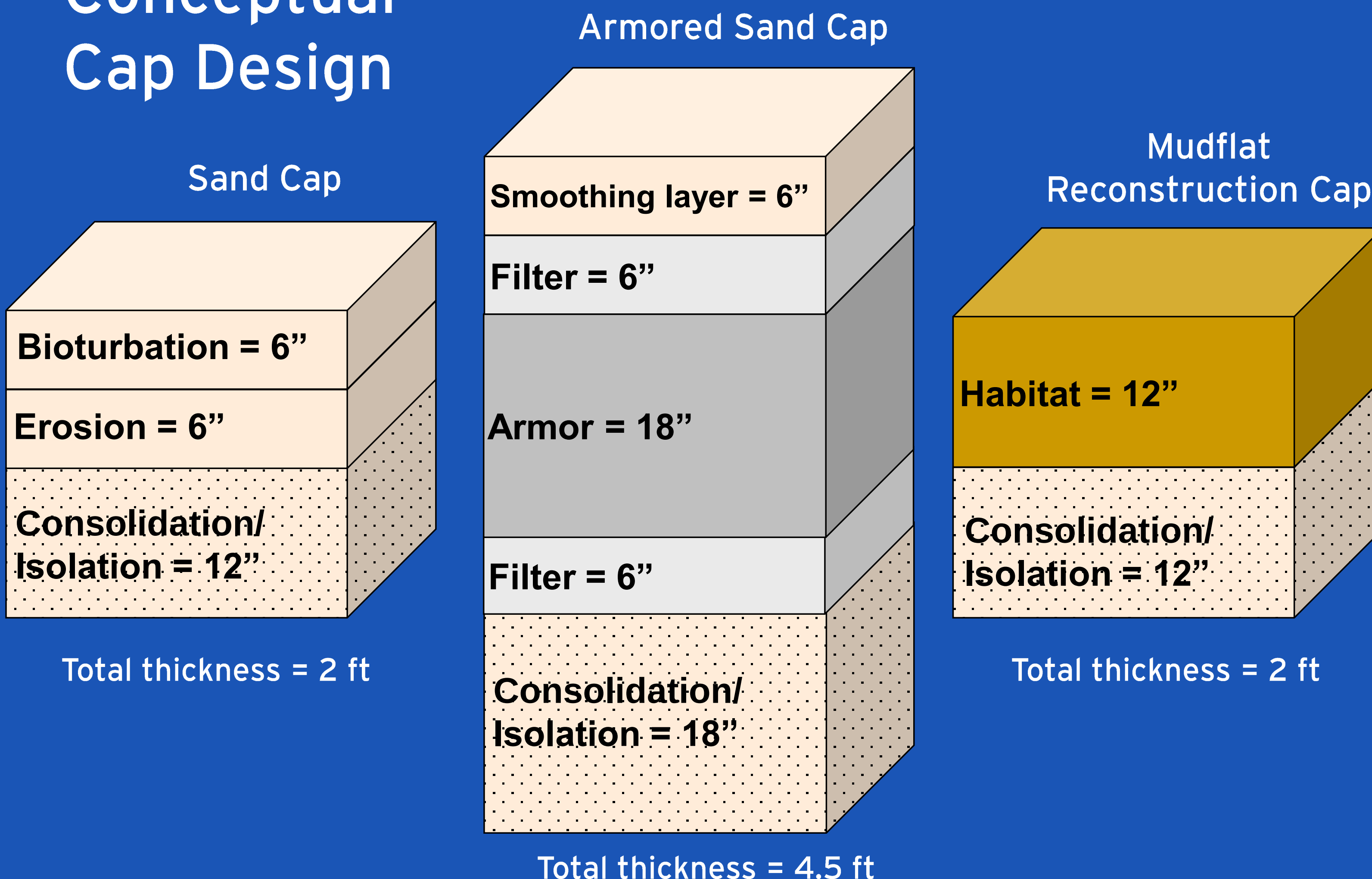
Conceptual Cap Design



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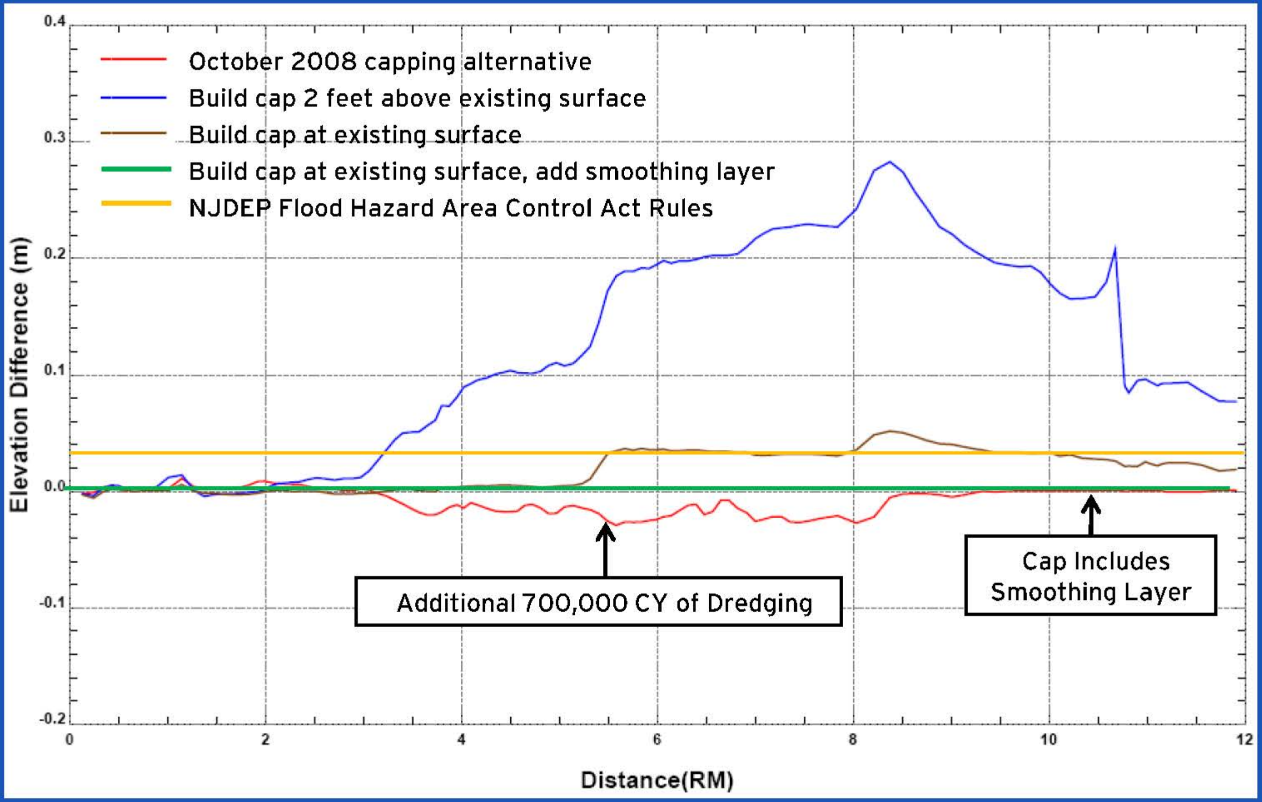
Cap Erosion and Flood Modeling Results



Note: Alternative 3 (Capping with Dredging for Flooding and Navigation) not modeled, but results are expected to be similar to constructing a cap at existing surface with smoothing layer (similar sediment surface, greater water depths).

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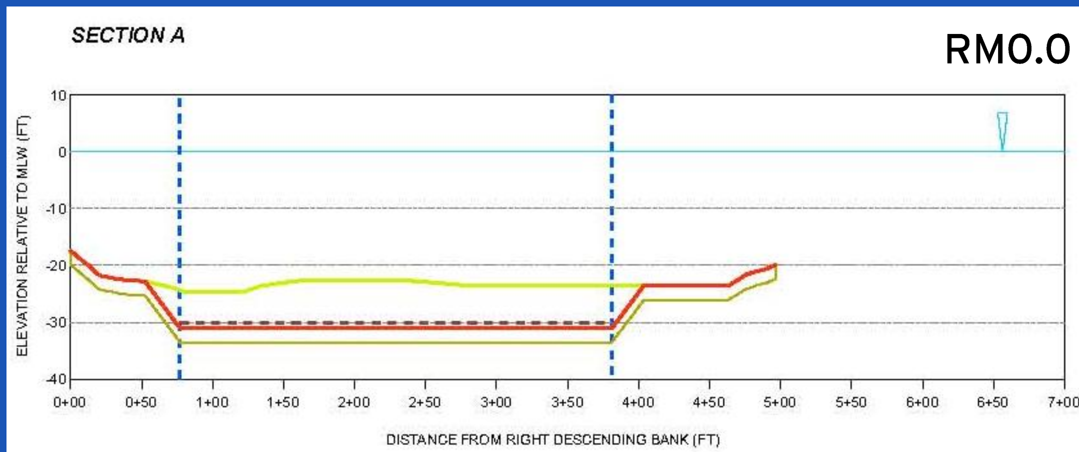
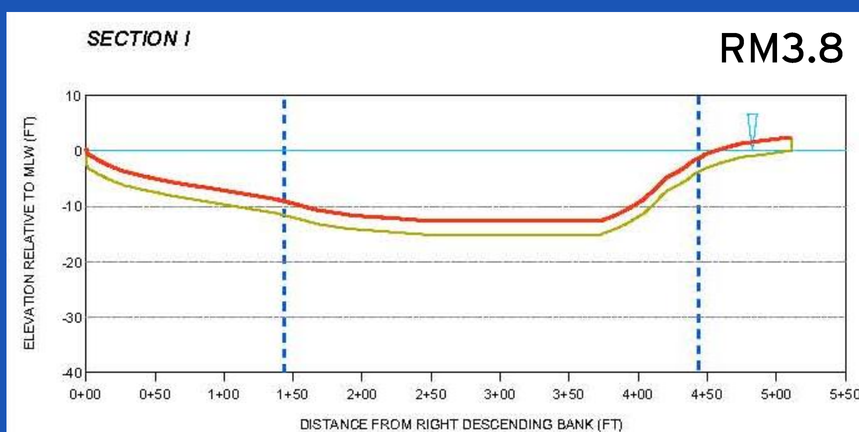
NORTH
ARLINGTON
KEARNY
EAST
NEWARK
HARRISON
Operable Unit
80 Lister
Avenue
US1&9 Truck
Route (Raymond
Blvd.)
NEWARK
Navigation
JERSEY
CITY
0 0.25 0.5 1
Miles

Cross-Sections for Capping Alternative



Navigation

- RM0-RM1.2: 30 ft MLW (300 ft wide)
- RM1.2-RM1.9: 16 ft MLW (300 ft wide)



- RM1.9-RM8: Minimum of 10 ft MLW (200 ft wide)

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Conceptual Design: Navigation in Capping Alternative

River Mile	FFS Alternative 3		
	Channel Width (ft)	Minimum Top of Cap Depth in Channel (ft MLW)	Channel Maintenance Planned
RM0-RM1.2	300	31	✓
RM1.2-RM1.9	300	19	✓
RM1.9-RM2.5	200	13	
RM2.5-RM3.6	200	11	
RM3.6-RM4.6	200	10	
RM4.6-RM8	200	10	

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Dredged Material Management (DMM) Scenarios

DMM Scenarios Incorporated Into FFS Alternatives
CAD/CDF Disposal
Off-site Treatment and Disposal
Local Treatment and Disposal or Beneficial Use

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DMM Process Flow

Dredge

Scow Transport

Hydraulic Offloading

Courtesy of John Henningson; Henningson Environmental Services, Inc.

CAD/CDF

http://www.pbworld.com/library/technical_papers/pdf/42_ContaminatedSedimentCDF.pdf

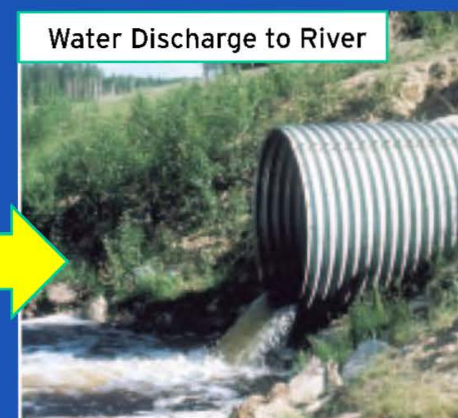
Dewatering

http://www.geotubes.com/PDF/brochures/DewateringBrochure_LR_FINAL.pdf

Water Treatment

http://www.pulpandpaper-technology.com/contractors/environmental/purac/

Water Discharge to River



http://www.dfo-mpo.gc.ca/regions/central/pub/fact-fait-mb/mb1_e.htm

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DMM Process Flow (continued)

Off-site Treatment

http://www.christmas-shopping.com.au/thomas-and-friends-gordon.html

Dewatered Material

http://www.geotubes.com/PDF/brochures/DewateringBrochure_LR_FINAL.pdf

Local Thermal Treatment

Beneficial Use

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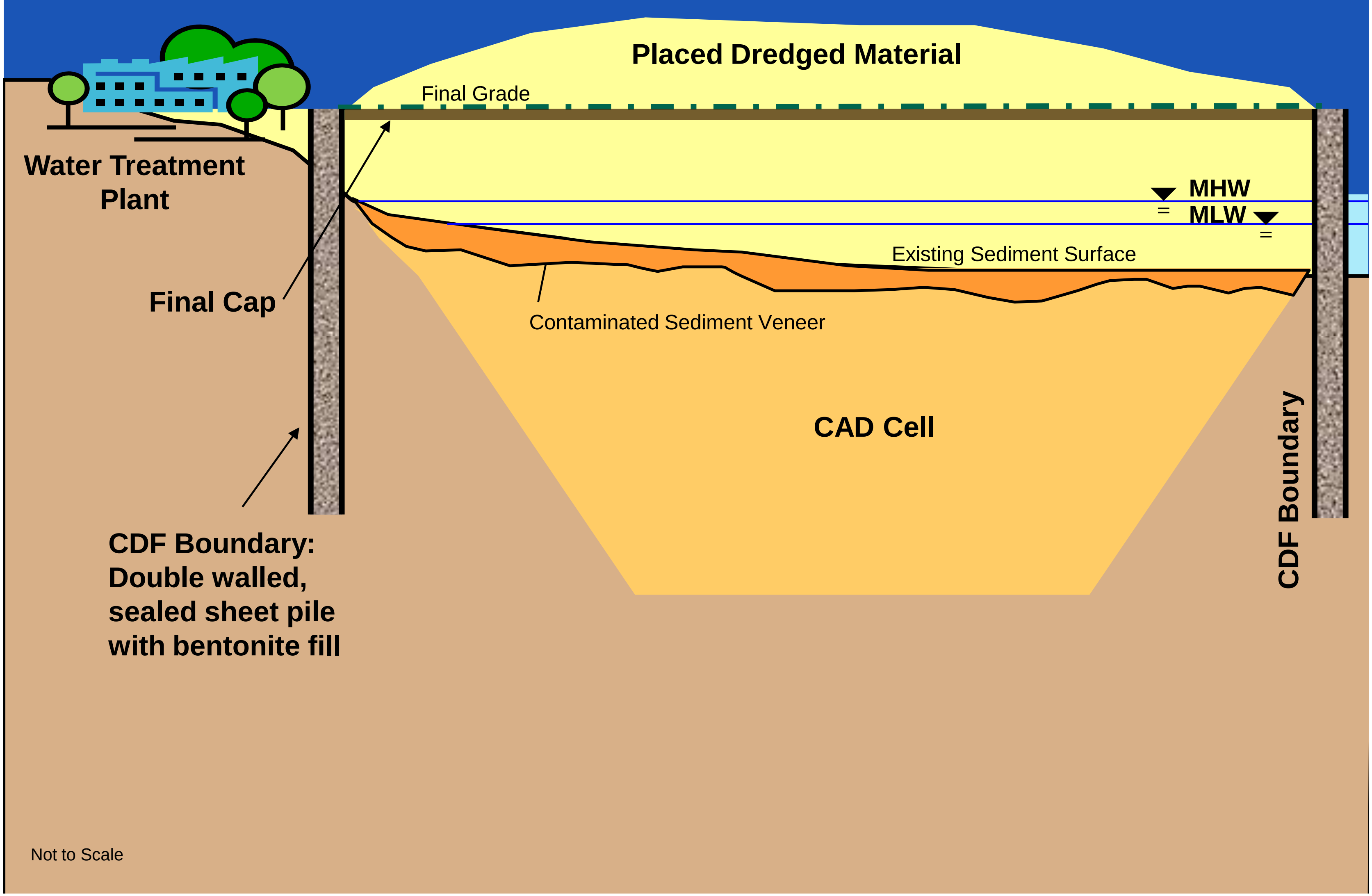
Disposal Options

Adapted from: NRC, 1997

Nearshore CDF Concept



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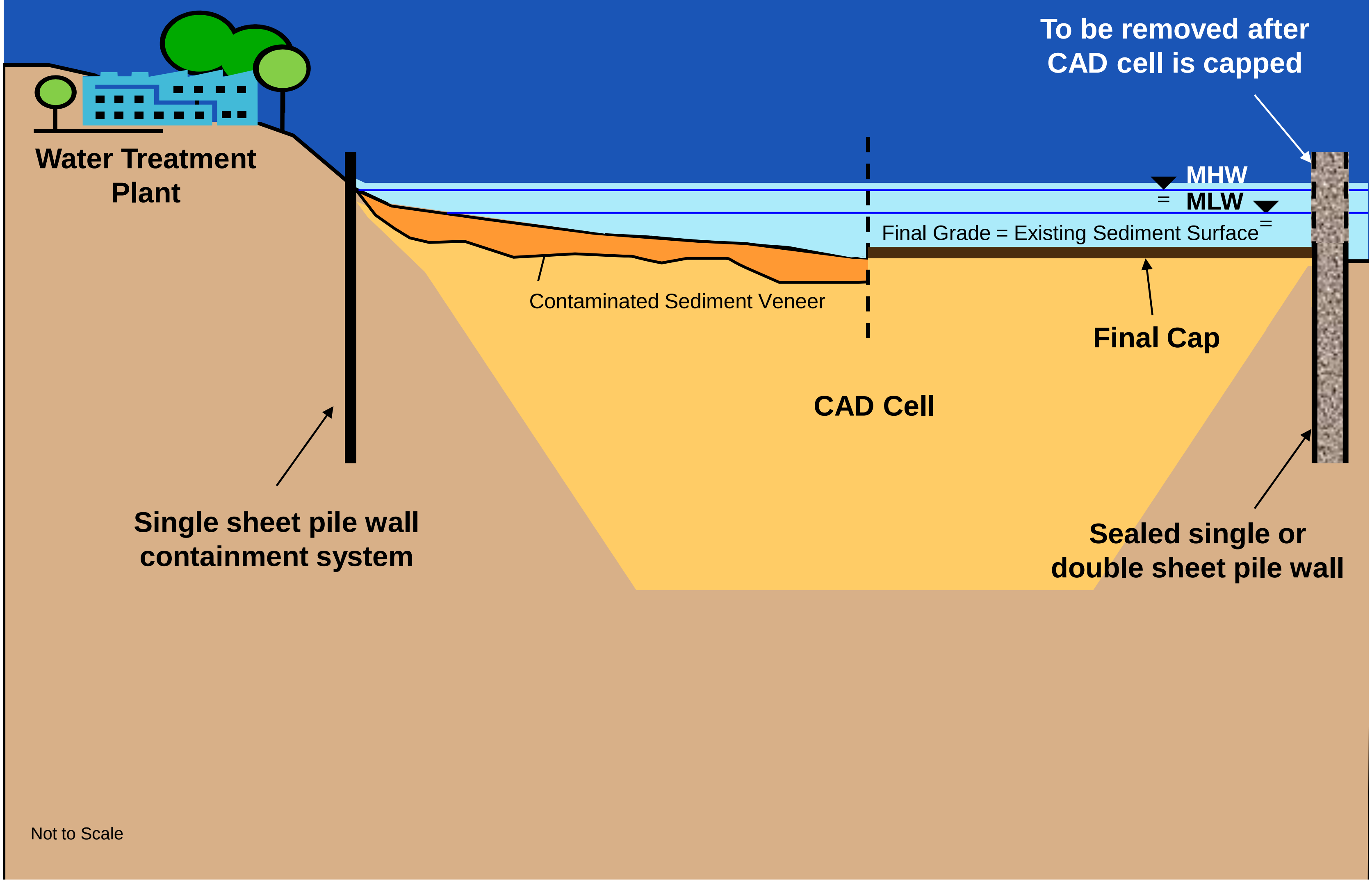
CAD Concept



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CAD/CDF Siting Considerations

- Proximity to dredging site
- At least 100 ft from nearest navigation channel
- Draft for approach (need ~20ft @ MLW for scow/barge)
- Depth to bedrock (storage volume)
- Appropriate geological formation for sub-grade cell (red-brown clay or glacial till)
- Air draft
- Potential impacts to habitat
- Potential flooding impacts
- Quantity of contaminated sediment veneer
- Water quality (construction, operational)
- Pumping distance for hydraulic offloading

Ref: USACE, 2007

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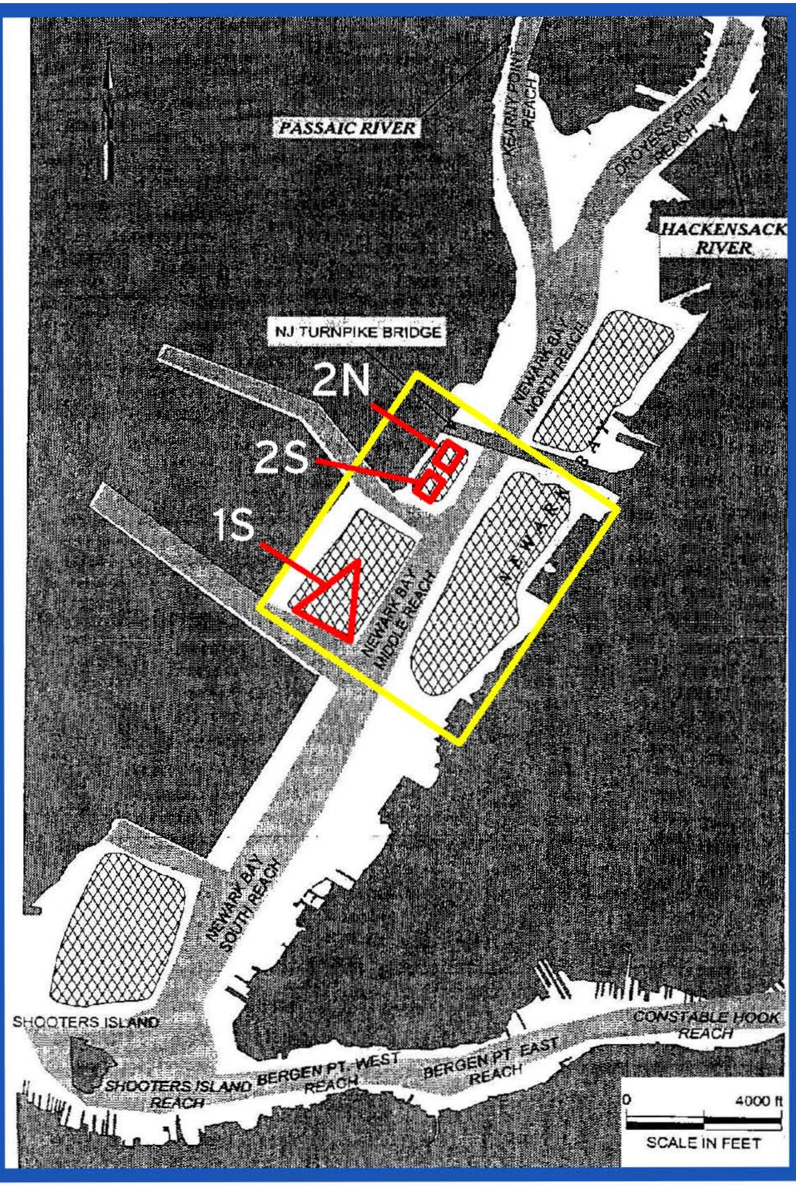
CDF Locations Evaluated in Newark Bay EIS



Source: USACE-NYD, *Final EIS on the Newark Bay CDF*, April 1997

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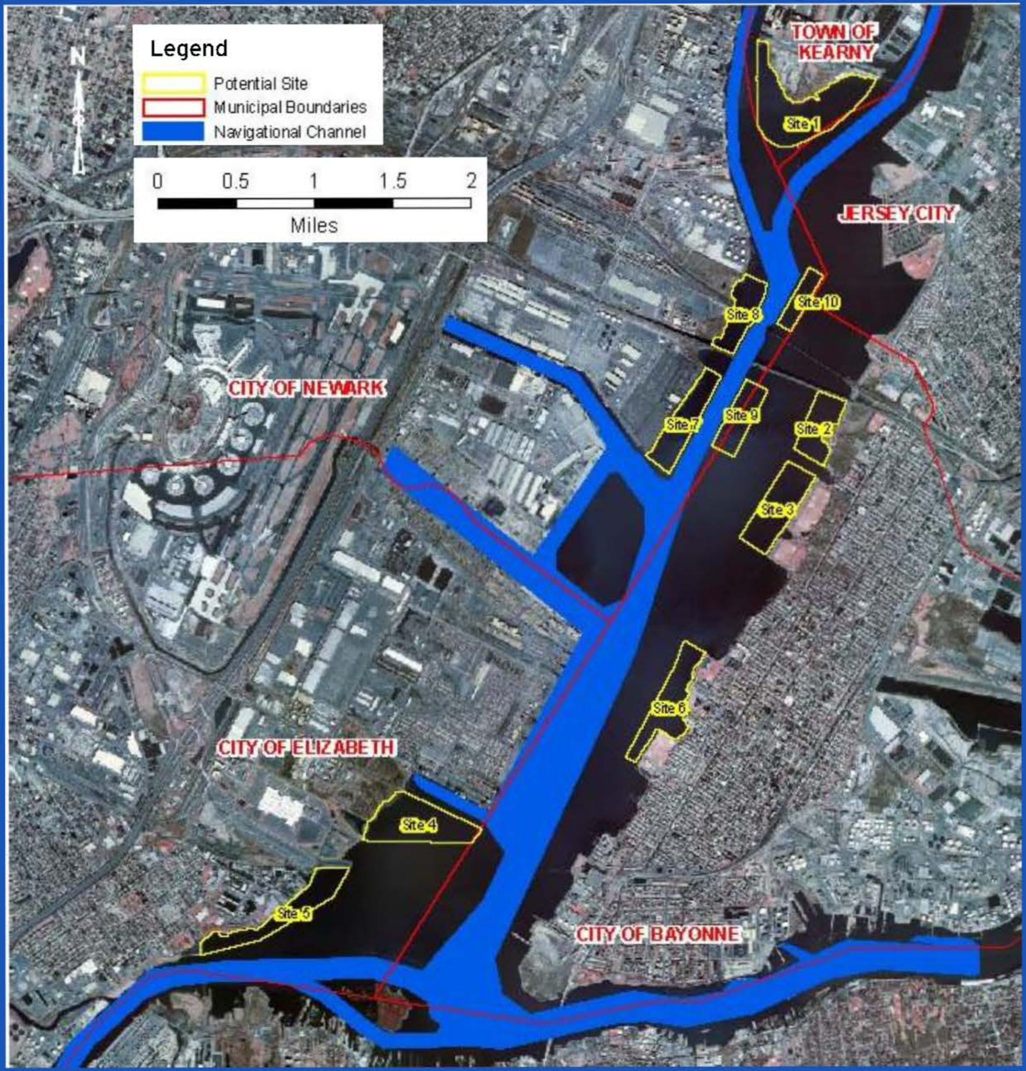
Potential Newark Bay CDF/CAD Locations



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Conceptual Design: Alternative 3 CAD/CDF

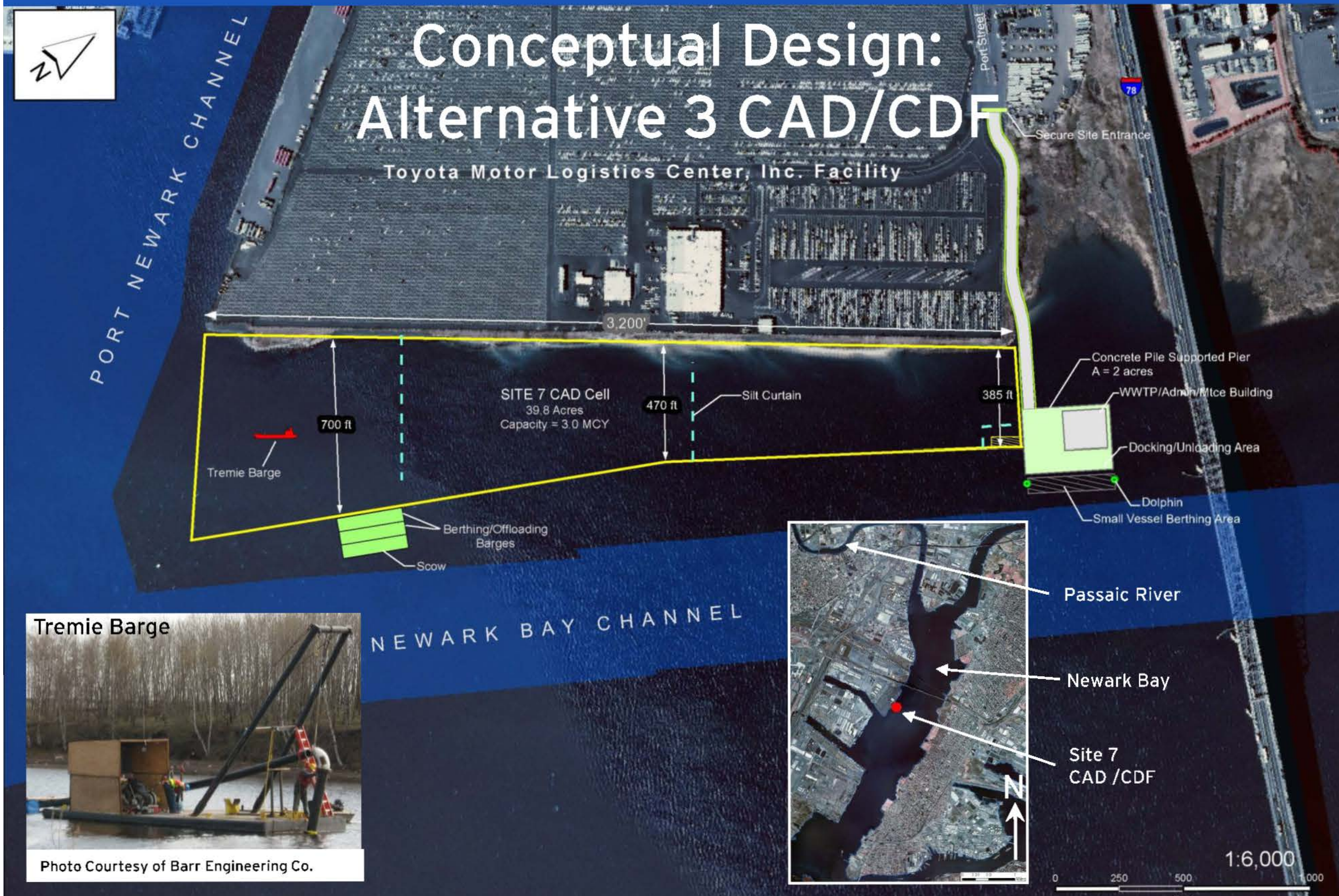

Photo Courtesy of Barr Engineering Co.

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CDF vs. CAD Comparison

Example: Alternative 3 (Capping) at Site 7 in Newark Bay

Design Parameter	CDF	CAD
Site footprint	40 acres	40 acres
Capacity	4 MCY (assumes 0% bulking)	3.0 MCY (assumes 10% bulking)
Depth	70 ft below MLW	
Disposal of veneer	Upland	
Containment	Permanent, double sheet pile wall, bentonite fill	Double sheet pile wall with bentonite fill; removed after CAD is capped
Division into internal cells	Yes (3 cells, center cell not fully excavated)	No (fully excavate entire footprint)
Finished grade	+10 ft MLW (average adjacent land elevation)	-3.4 ft MLW
Habitat impact	Permanent	Temporary

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Off-site Treatment and Disposal: Conceptual Design

http://clark.cleanharbors.com/ttServerRoot/Download/13603_FINAL_Deer_Park_TX_Facility_FS_120408.pdf

- Passive dewatering with geotextile containers (tubes) in bermed, lined containment area
- Rail transportation assumed
- TSDFs in Utah, Texas, and Canada

Alternative	Dewatered Material Generation Rate	Total Offsite Treatment Capacity	Storage Required	Years of Storage After Dredging Complete
Alt 2: Dredging	~1.1 MCY/yr	0.25 MCY/yr	150 acres	20-30 years
Alt 3: Capping	~0.39 MCY/yr	0.25 MCY/yr	30 acres	4-6 years

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Local Treatment and Disposal or Beneficial Use: Conceptual Design

- Passive dewatering with geotextile containers (tubes) in bermed, lined containment area
- Thermo-chemical process: >99% treatment efficiency [1]
- Product can be mixed with Portland cement
- Treatment technologies for vapor phase lead need prove out

ENDESCO Clean Harbors, L.L.C. / GTI, 2008

Alternative	Dewatered Material Generation Rate	Thermal Treatment Capacity	Storage Required	Years of Storage After Dredging Complete
Alt 2: Dredging	~1.1 MCY/yr	0.76 MCY/yr	60 acres	4-6 years
Alt 3: Capping	~0.39 MCY/yr	0.50 MCY/yr	Minimal	Minimal

[1] ENDESCO Clean Harbors, L.L.C. / Gas Technology Institute, 2008. Used Cement-Lock® process with Lower Passaic River sediments. Incorporated Ecomelt® production.

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Off-site and Local Treatment:
Upland Processing Facility Siting Considerations

- Sufficient acreage
- Suitable current land usage and zoning (industrial, low level of development). Sufficient distance from residential areas, public use/parkland, wetlands.
- Waterfront access (sufficient shoreline frontage, proximity of shoreline to a navigable channel)
- Road access (proximity to highways, routes that do not pass through residential areas)
- Rail access (proximity to rail lines/spurs)
- Soil characteristics to support expected loads

Ref: USACE, 2007

Construction-Phase Impacts

- Evaluated:
  - Resuspension, releases, residuals
  - Impacts to biota/habitat
  - Air quality
  - Carbon footprint
  - Odor, noise, lighting
  - Accidents
  - Project-generated traffic (including vessel traffic)
  - Impacts to recreation & aesthetics
- Drivers:
  - Volume/inventory
  - Construction duration
  - Number of dredges
  - DMM scenario

Construction-Phase Impacts

No Action Capping Dredging

Greater Anticipated Impact →

CAD/CDF Local Treatment Off-site Treatment

Annual Contaminant Releases:

Alternative	Dredging Duration (years)	Annual 2,3,7,8-TCDD Release, Compared to Existing 2,3,7,8-TCDD Mass Transport to Newark Bay (5.8 grams/year) [a]
Alt 2: Dredging	7	6 times greater
Alt 3: Capping	6	2 times greater

a: Assumes 1% resuspension at the far field.

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Recap of Current Alternatives

#	Alternative[a]	DMM Scenario	Dredged Sediment Volume (MCY)	Cost in Billion $	Other Considerations
1	No Action	N/A	0	Minimal	Existing level of risk
2	Deep Dredging with Backfill	CAD/CDF Disposal [b]	11	1.3	Habitat impact, construction-phase impacts, long-term maintenance
		Off-site Treatment and Disposal		3.7	Large on-land footprint, construction-phase impacts
		Decontamination and Beneficial Use		1.6	Large on-land footprint, emissions, construction-phase impacts
3	Capping with Dredging for Flooding & Navigation	CAD/CDF Disposal [c]	3.4	0.8	Habitat impact, long-term maintenance
		Off-site Treatment and Disposal		2.0	Large on-land footprint, long-term maintenance
		Decontamination and Beneficial Use		0.9	Large on-land footprint, emissions, long-term maintenance

Notes:

a: All alternatives cause no additional flooding.

b: Alternative 2 - Cost provided for a CDF.

c: Alternative 3 - Cost provided for a CAD/CDF.

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Ongoing FFS Evaluations

- Sediment Transport Modeling Scenarios
- CARP Modeling for contaminant trajectories
- Risk Assessment
  - Current HHRA & ERA undergoing QC
  - Future HHRA & ERA in progress, using output from CARP modeling
- Revision of Comprehensive CSM based on modeling output

DISCUSSION

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